

**NUCLEAR REGULATORY COMMISSION**

**10 CFR Part 50, 52, 54, and 100**

**[Docket No. PRM-50-106; NRC-2012-0177]**

**Environmental Qualifications of Electrical Equipment**

**AGENCY:** Nuclear Regulatory Commission.

**ACTION:** Petition for rulemaking; notice of receipt.

**SUMMARY:** The U.S. Nuclear Regulatory Commission (NRC or the Commission) received a petition for rulemaking (PRM), dated June 18, 2012, which was filed with the NRC by the Natural Resources Defense Council, Inc. (NRDC) and Mr. Paul M. Blanch (collectively, the petitioners). The petition was docketed by the NRC on June 22, 2012, and assigned Docket No. PRM-50-106. The petitioners request that the NRC initiate a rulemaking “to revise its regulations to clearly and unequivocally require the environmental qualification of all safety-related cables, wires, splices, connections and other ancillary electrical equipment that may be subjected to submergence and/or moisture intrusion during normal operating conditions, severe weather, seasonal flooding, seismic events, and post-accident conditions, both inside and outside of containment.” The NRC is not instituting a public comment period for this PRM at this time.

**ADDRESSES:** Please refer to Docket ID **NRC-2012-0177** when contacting the NRC about the availability of information for this petition. You may access information related to this petition, which the NRC possesses and are publicly available, by any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2012-0177**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-492-3668; e-mail: [Carol.Gallagher@nrc.gov](mailto:Carol.Gallagher@nrc.gov).

- **NRC's Agencywide Documents Access and Management System (ADAMS):**  
You may access publicly available documents online in the NRC Library at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[Begin Web-based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to [pdresource@nrc.gov](mailto:pdresource@nrc.gov). The ADAMS accession number for each document referenced in this notice (if that document is available in ADAMS) is provided the first time that a document is referenced. The petition, PRM-50-106, is available in ADAMS under Accession Number ML12177A377.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

**FOR FURTHER INFORMATION CONTACT:** Cindy Bladey, Chief, Rules, Announcements, and Directives Branch, Division of Administrative Services, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-492-3667, e-mail: [Cindy.Bladey@nrc.gov](mailto:Cindy.Bladey@nrc.gov).

## **SUPPLEMENTARY INFORMATION:**

### **I. The Petitioners**

The NRDC “is a national non-profit membership environmental organization with offices in New York City, Washington, D.C., San Francisco, Chicago, Los Angeles, and Beijing.” The NRDC’s “activities include maintaining and enhancing environmental quality and monitoring federal agency actions to ensure that federal statutes enacted to protect human health and the environment are fully and properly implemented.” Mr. Paul Blanch, the primary author of the petition, “is a consultant and expert witness” on “nuclear and electrical engineering.”

### **II. The Petition**

The petitioners request that the NRC “institute a rulemaking to revise the regulatory requirements for the environmental qualification of electrical equipment important to the safe operation of existing and new reactors.” Specifically, the petitioners request that “the regulatory requirements contained in 10 C.F.R. § 50.49, Criteria 2 and 4 in Appendix A to 10 C.F.R. 50, and 10 C.F.R. 54...be clarified and supplemented with regard to the environmental qualification of electrical equipment exposed to ‘submergence in water, condensation, wetting, and other environmental stresses’ during routine operation and infrequent events (e.g., flooding).”

The petitioners state that the designs for nuclear power plants currently operating in the U.S. “feature electrical cables and wires between power sources (e.g., transformers, batteries and emergency power supplies) and safety equipment throughout the facility.” The petitioners further state that “[w]ith few exceptions, these cables and wires are only designed for dry, low humidity environments and, therefore, not qualified for moist or wet environments. Cables and wires with insulation surface defects caused during or exacerbated by installation are more prone to failure when submerged in water or subjected to moisture intrusion. It was generally assumed (petitioner Blanch included) that these containers would remain dry.” The petitioners

assert that “[b]y existing NRC regulation, it was unnecessary to specify that these cables and wire remain functional under submerged conditions.”

The petitioners state that “General Design Criterion (GDC) 2, Design Bases for Protection Against Natural Phenomena, and GDC 4, Environmental and Dynamic Effects Design Bases, established regulatory requirements for the design of nuclear power plants.” The petitioners assert that “[t]he large number of electrical failures that were experienced during the Three Mile Island (TMI) accident in March 1979 demonstrated that these regulatory requirements, or their enforcement, were inadequate to ensure that electrical equipment would remain functional.”

The petitioners interpret NUREG/CR-6384, Vol. 1, "Literature Review of Environmental Qualification of Safety-Related Electric Cables" (ADAMS Accession Number ML031600732), dated April 1996, to indicate that “[t]he aforementioned ‘high probability of impairment’ that helped focus the selection of cable penetrations during TMI inspections already indicates that moisture and submersion causes cable damage and demonstrates NRC's acknowledgment of the matter thus corroborating the necessity of this rulemaking. If these conditions cause a high probability of impairment following an accident, it is logical to assume that these conditions produce a similar outcome in the absence of or prior to an accident as well.”

The petitioners state that “[t]he NRC recognized from the TMI accident the need to strengthen the regulatory requirements for electrical equipment. The NRC revised its regulations to include specific requirements in 10 C.F.R. §50.49, wherein § (e)(6) explicitly addressed the submergence factor[.]” The petitioners further state that “[t]he regulation did not further limit this requirement to where the cables and wires were located. But the NRC staff introduced such a limitation through... Generic Letter 82-09, ‘Environmental Qualification of Safety-Related Electrical Equipment,’ [ADAMS Accession Number ML031080281], dated April 20, 1982[.]” The petitioners state that “[r]ain water and ground water routinely submerge underground cables and wires. The safety implications from the failure of a safety-related cable

inside containment submerged by an accident, outside containment submerged by a high energy line break, or outside containment submerged by nature are identical—that safety function is lost. It matters little if the portion of a safety-related cable inside containment and the portion of that same cable outside containment in a high energy line break area survive if another portion of that same cable routed underground fails due to submergence.”

The petitioners further state that “[t]he TMI accident and laboratory testing have shown that moisture/submergence of electrical cables and wires significantly increase the probability of failure. Failure of the cables and wires also causes failure of connected components[.]” The petitioners assert that “NRC requirements only state that safety systems should remain functional and do not provide conditions or acceptance criteria for degraded cables. Additionally, cable degradation as an ongoing process is not a reported issue unless it leads to the failure of a cable system or it is discovered that the cables are operating in conditions for which they were not intended.” The NRC issued two Information Notices regarding submerged electrical cables, Information Notice 2002-12, “Submerged Safety-Related Electrical Cables,” (ADAMS Accession Number ML020790238) and Information Notice 2010-26, “Submerged Electrical Cables,” (ADAMS Accession Number ML102800456). The petitioners stated that the NRC did not request specific action from the licensees. The petitioners further state that “[t]he observations in [Information Notice] 2010-26 range from licensee failures to establish preventative maintenance and test programs or their failure to verify and maintain suitable environments for series of electrical cable systems. In certain cases, the inspections discovered that a number of cable systems were being subjected to conditions for which they were not designed for, such as ‘continuous underwater environments,’ which led to concerning levels of insulation degradation and cable failure. These affected cable systems included safety-related power cables, where the inspectors noted that failures in these systems could disable important accident mitigation systems.”

In Staff Requirements Memorandum (SRM) for SECY-92-223, “Resolution of Deviations

Identified During the Systematic Evaluation Program,” (ADAMS Accession Number ML003763736), dated September 18, 1992, the Commission provided direction to its staff regarding the applicability of the GDC. The petitioners state that “[t]he problem is that past NRC decisions have constrained or eliminated the applicability of these regulatory requirements” and “the Commission has determined that these requirements are NOT to be applied to the majority of reactors.” The petitioners further state that “[t]he regulation did not further limit this requirement to where the cables and wires were located.” The petitioners assert that a statement by Judge Ann Marshall Young “further expounds on the need for rulemaking and clarification of 10 C.F.R § 50.49 to address cables that may be exposed to harsh environments during normal, abnormal, and accident conditions. Electrical cables and wires are prone to accelerated failure rates when submerged in water or exposed to high humidity unless designed and qualified for these environmental conditions. The NRC's regulatory requirements address environmental qualification of safety-related systems, structures, and components, including electric cables and wires.”

The petitioners state that “[t]his rulemaking will supplement and clarify NRC's regulatory requirements to ensure that safety-related electrical cables and wires will be properly qualified for all the environmental conditions they may experience during routine operation and following accidents regardless of when a reactor received its construction permit or where the safety-related cable is located.”

Dated at Rockville, Maryland, this 21<sup>st</sup> day of September, 2012.

For the Nuclear Regulatory Commission.

**/RA/**

Annette L. Vietti-Cook,  
Secretary of the Commission.